REMARKS/ARGUMENTS

Applicant's counsel thanks the Examiner for a very thorough examination of the application. By this Amendment, claims 1 and 2 have been amended to specify that "y" in the recited AlCr film composition is in the range of $0.66 \leq y \leq 0.695$, and also that the film has a cubic crystal structure. No new matter has been entered. Basis for the recited range for "y" is found in the application as-filed, specifically in Experiments 3, 9, 11, 13, 17, 20, 22, 30, 38, 39, 40, 42 given therein, where compositions having "y" in this range were shown to exhibit unexpectedly superior performance compared to other conventional compositions, and even compared to other AlCr compositions where "y" was outside this range. Basis for the "cubic crystal structure" is found in claim 7 as-filed, which has now been canceled.

Applicant affirms the election without traverse of claims 1-15 for prosecution on the merits in this application. Accordingly, the remaining claims, 16-24, are withdrawn from consideration, though they have been retained in the application. Of these, claims 16 and 21 have been amended so that they now incorporate every limitation in claim 1 currently pending; claim 22 has been canceled without prejudice. All the remaining withdrawn claims depend either directly or indirectly from claim 16 or 21, and consequently each incorporates all of the limitations of claim 1. Therefore, on the allowance of claim 1, it is respectfully requested that the withdrawn claims be rejoined in the application, and examined pursuant to the Office's rejoinder procedure, MPEP § 821.04.

The claims have been rejected under 35 USC § 112, first paragraph on the ground that "support for y being 0.2-0.45 could not be found," and that "support could not be found for X being N, C, B, CN, BN, CBN" on the basis that O must be always included in X. Respectfully, these bases of rejection are traversed. Initially, "y" in the claims as previously pending was between 0.3 and 0.7, not 0.2-0.45 as the Examiner has indicated. It is believed this first rejection was in error, and in any event is moot in view of the currently amended claims. As for X being selected from among the recited species, support is clearly found in the application, e.g. at the top of page 7, where X can be selected from among the recited species, including those recited in the claims that do not contain O.

The claims also have been rejected under 35 USC § 112, second paragraph

on the ground that "claim 1 recites the broad recitation a work piece, and the claim also recites specific types of work pieces," creating 'broad range - narrow range' indefiniteness. Respectfully, this rejection also is traversed. Claim 1 is directed to a work piece having a coating thereon, where the work piece is one of the enumerated types. This is not a narrow range within a broad one, it is a limitation on the scope of the "work piece" that is the subject of the claim. Claim 1 has been amended to cancel "specifically," which it is believed may have given rise to confusion.

Claim 15 has been rejected under 35 USC § 112, second paragraph because the subscript "x" and the notation "Me" are not described. Claim 15 has been amended to specify that Me is selected from among Group IVb, Vb and VIb metals and silicon, basis for which can be found at page 7 of the specification. As for the subscript "x," such as found in MoS_x or MoW_x in claim 15, it is believed this does not render the claim indefinite. As known in the art, specifying the variable subscript "x" in these formulas is a common chemistry shorthand used to indicate that the precise stoichiometry is not critical and can be selected or identified for particular applications by a person of ordinary skill in the art.

The claims have also been rejected under 35 USC § 102(b) as being anticipated by numerous references. Each of these rejections, and the references and relevant claims, are discussed below in turn.

Claim 1 rejected over JP 09-041127 ("Kobe") and JP 10-025566 ("Yamaguchi")

Kobe discloses a film composition having the formula $(Al_{1-y}X_y)Z$, wherein X can be Cr and $0 < y \leq 0.3$ (see Abstract). As can be seen, in Kobe "y" must be less than or equal to 0.3, but greater than zero. Taking the extremes of this range, if y were zero (or near zero) in this formula, it would reduces nearly to AlZ. If y is 0.3, the resulting composition is $Al_{0.6}Cr_{0.3}Z$ (assuming X = Cr). Conversely, as amended the film composition recited in claim 1 does not lie within or overlap this range. Specifically, claim 1 has been amended to specify that "y" therein is in the range of 0.66 to 0.695. Therefore, with lowest value for "y," the claimed film composition is now $Al_{0.66}Cr_{0.34}X$. Therefore, clearly claim 1 is not anticipated by Kobe. It is also noteworthy to point out that Kobe provides no teaching or suggestion to use other values outside the range specified in that reference, and especially no teaching to use a composition range as now claimed.

With respect to Yamaguchi, claim 1 has been amended to specify the AlCrX film has a cubic crystal structure. Yamaguchi does not disclose that its Al-Cr-N composite film has a

cubic crystal structure. Accordingly, claim 1 is not anticipated by Yamaguchi and this rejection has been overcome.

Claim 1 rejected over Kunisch et al.

Kunisch et al. disclose an Al-Cr-N coating in tables 2 and 3. To compare these compositions with claim 1, they have been recalculated below to match the $Al_y Cr_{1-y}$ formula in the claim, which does not take into account additional elements ("X" in claim 1).

For the table 2 composition from Kunisch et al., the layer deposited in Ar had 53.3 mol% Cr and 19.1 mol% Al, ignoring the other elements present, which equates to $Al_y Cr_{1-y}$ with y = 0.264, 1-y = 0.736. The layer deposited in N_2 had 29.6 mol% Cr and 12.5 mol% Al, again ignoring other present elements, which equates to $Al_y Cr_{1-y}$ with y = 0.297, 1-y = 0.703. It will readily be seen both these compositions are well outside the range now claimed, where "y" is 0.66-0.695.

For the table 3 composition from Kunisch et al., the layer deposited in Ar had 55 mol% Cr and 20 mol% Al, which equates to $Al_y Cr_{1-y}$ with y = 0.267, 1-y = 0.733. The layer deposited in N_2 had 31 mol% Cr and13 mol% Al, which equates to $Al_y Cr_{1-y}$ with y = 0.295, 1-y = 0.705. Again, both these compositions are well outside the range now claimed, where "y" is 0.66-0.695.

In summary, Kunisch discloses compositions wherein, when viewed as an empirical formula analogous to that presently claimed, the variable y is less than 0.3, which is well below the claimed range. Accordingly, the rejection of Kunisch et al. has been overcome.

Claim 1 rejected over Kawate

Kawate describes $Cr_{1-x} Al_x$ films on cemented carbide substrates. His experiments have been performed with $Cr_{1-x} Al_x$ targets with 0, 20, 40, 60, 70, 80, 90 and 100 atom% (S. 569, left column, lower third). Importantly, Kawate reports (p. 569, text accompanying Fig. 1) "Crystal structures of $Cr_{1-x} Al_x$ N films were changed from the NaCl type for $x \leq 0.6$ to the wurtzite for $x \geq 0.7$." Wurtzite structure means a hexagonal crystal structure. Additionally Kawate mentions a drastic change of microstructures between x=0.6 and 0.7 on p.571. Within that range given by Kawate, one would expect a wurtzite structure for $0.66 \leq x \leq 0.695$ in that reference, or a composition with predominatly wurtzite structure. Conversely, in claim 1, when y is in this range the film composition has a cubic crystal structure. Accordingly, the rejection over Kawate is also believed overcome.

Claim 2 rejected over Sanchette

Sanchette describes Al-TM-(N) (TM = transition metal = Ti, Cr) amorphous coatings on glass and steel substrate with an eye on corrosion protection. Figures 1, 2, 4, 5 indicate

a "composition in TM (at%)" for Cr between 0 and 44. Since Sanchette focuses on *amorphous* aluminum alloy coatings for construction steels applied in corrosive environment, he does not meet the features of claim 2 as amended, namely a cubic crystal structure.

Claim 1 rejected over Ide et al.

Ide. et al. investigates the properties of Cr-Al-N films on glass and steel substrates. Three different types of targets are used in the reference, with Al/Cr ratios of 75/25, 50/50 and 25/75 (table 2). Re-calculated according to the $Al_y Cr_{1-y}$ formula in claim 1, this equates to "y" being equal to either 0.25, 0.5 or 0.75. Ide et al. nowhere disclose providing an $Al_y Cr_{1-y}X$ composition where y is in the specific range of 0.66-0.695 as recited in claim 1. Accordingly, claim 1 is not anticipated by Ide et al., and this rejection is believed overcome.

Claim 1 rejected over Vetter et al.

Vetter et al.describe Cr-Al-N films by cathodic arc evaporation from Al and Cr targets. Figures 2 and 3 show layer compositions with Al-content betweeen 0.3 and 0.63 atom%. Re-calculated to match the $Al_y Cr_{1-y}$ formula in claim 1, this equates to $0.3 \leq y \leq 0.63$. Claim 1 has been amended to specify $0.66 \leq y \leq 0.695$, which is not anticipated by Vetter et al. Moreover, no particular crystal structure could be determined (page 1235, para 3.4, "...the lack of a second peak (or more peaks) makes it difficult to determine the present phases in the coating". Note that claim 1 also specifies the film to have a cubic crystal structure. In view of the foregoing, the rejection of claim 1 over Vetter et al. is also believed to be overcome, as this reference does not anticipate that claim.

Claims 1 and 2 rejected over Pat. No. 6,827,976 ("Derflinger")

Derflinger describes (fig. 1, 3) a multilayer system essentially comprising on a base body (1), a hard material layer system (2, 2a) an intermediate layer (3) and a slide layer (4). The hard material layer system (2) is described (col. 2, line 51 ff) as a Nitride, Carbide ...of at least one metal. Table 1 in col. 4 explicitedly describes CrAlN as hard material layer 2a or 2. However, no ratios for Cr and Al are mentioned and no specific advantages thereby anticipated. Both claims 1 and 2 specify very specific ratios of Cr:Al, namely that $0.66 \leq y \leq 0.695$ for the formula $Al_y Cr_{1-y}$. Derflinger does not anticipate this defined range of compositions. Accordingly, it does not anticipate either claim 1 or 2, and the rejection based on that patent is believed overcome.

Claims 1 and 2 rejected over each of Pats. Nos. 6,790,543 ("Kubota") and 6,586,122 ("Ishikawa")

Kubota discloses a tool with a hard coating layer comprising Ti and B as metal elements with a boron nitride phase. The only metioned combinations of Al and Cr can be found in table 3, samples 40 and 50. However, in both those samples the ratio of Al:Cr was 45:5. Equating this to the $Al_y Cr_{1-y}$ formula in the claims results in y=0.9, well outside the claimed range. Nothing in Kubota remotely discloses the composition as-claimed.

Ishikawa discloses a multilayer coated cutting tool with a Si-containing coating film as a second (top) layer. A first layer to be deposited directly on said tool shall comprise one or more metal(s) (Ti, Al, Cr) and one or more non-metallic elements (N, B, C, O). One example (col. 8, table 1, example 6) shows an $Cr_{50} Al_{50}$ N layer, which corresponds to y = 0.5 in the claimed formula. Again, this is well outside the claimed composition. Nothing else in Ishikawa remotely discloses the compositions as claimed.

Claims 1 and 2 rejected over each of Pat. No. 6,274,257 ("Aharonov") and JP 06-322517 ("Masumoto")

Aharonov describes an erosion protection coating with a "doped chromium nitride." Clearly, then, other components besides Cr and N ("chromium nitride") are to be considered the "dopants" in Aharonov. Col. 2 lines 11-12 of Aharonov disclose that preferred "dopant" ranges are in the range of 1-10 atomic percent. Therefore, for an AlCrN composition, in which N would be the "dopant," Aharonov teaches it is to be present in an amount not more than 10 atom%. Considering the claimed AlCr formula, namely $Al_y Cr_{1-y}$ in present claims 1 and 2, in order for the relation $0.66 \leq y \leq 0.695$ to be satisfied, the Cr content of the composition also would have to be 10% or less (in fact much less based on the above formula), which is not expected (certainly it is not disclosed) for a nitrogen-doped "chromium nitride." Furthermore, this reference nowhere discloses the precise composition recited in the claims. Accordingly, Aharonov does not anticipate either claim 1 or 2.

Masumoto discloses a wear resistant amorphous film with, in adapted wording, $Al_y X_{1-y}$ with X = Cr, Ti, Mo, W, Fe,... and $0.6 \leq y \leq 0.985$ plus N, O, C. Conversely, both claims 1 and 2 specify the claimed film composition has a cubic crystal structure. Accordingly, Masumoto does not anticipate either claim 1 or 2.

For at least the foregoing reasons, it is submitted that all the rejections of claims 1 and 2 have now been overcome. All remaining claims (including the withdrawn claims) either depend from claim 1 or 2, or incorporate all of the limitations of at least one of those

claims. Accordingly, it is respectfully submitted that all claims are now in condition for allowance.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 16-0820, our Order No. 35523US1.

Respectfully submitted,

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